

Barricading makes a comeback?

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Underground coal miners have always faced the risk of having to escape a mine fire or explosion. Before self-rescue devices, they would often barricade rather than risk escaping bare-faced through a toxic atmosphere. Barricades were often crudely constructed of brattice curtain, timbers, nails, and whatever other materials the miners could find. However, barricaded miners were often found dead because their chamber became oxygen-deficient, carbon monoxide leaked in, or they tore down the barricade too soon upon hearing a rescue team approach. Even after filter self-rescuer devices were introduced, miners were taught barricading techniques. Following advances in sophisticated seismic sensing equipment in the 1970's, a signaling protocol was developed for locating barricaded miners.

The barricading ideology began to change in the early 1980's with the introduction of self-contained self-rescuers (SCSR's) that provided miners with enough oxygen to reach the first split of fresh air. Although MSHA still mandates instruction in barricading, greater emphasis is now placed on teaching miners to use SCSR's proficiently and to be knowledgeable about their escape routes. Only recently has at least one mine operator begun to revisit barricading as an alternative to escape.

Since early 1996, this U.S. coal

mine has been mining super longwall panels up to 1,000 feet wide and nearly 19,000 feet long. What is unique about this mine is the pitch of the coal seam. Starting with the setup entries at the back end of the panels and proceeding outby for about 9,000 feet, the coalbed dips downward on a 7% to 10% pitch. Once mining has reached midpanel, the coal begins pitching upward on about the same percent grade (i.e., the coal forms a basin at midpanel). As a result, miners working on the longwall must escape uphill for about 1.75 miles before reaching the mains. From there, they continue uphill on grades of up to 11% to reach the portal. Escaping this mine on foot would require significant time, energy, and oxygen.

As a result, mine personnel constructed barricade chambers in crosscuts in the mains and between the longwall panels. The chambers have large concrete bulkheads on each end that are fitted with an airlock. Boreholes from the surface provide fresh air and water. The chamber in the mains is fitted with a lined shaft that permits lowering an escape capsule from the surface. The mine stores additional SCSR's in the chambers, along with first aid and other supplies.

NIOSH researchers worked with mine personnel to develop a simulated decision-making exercise to teach workers about barricading. The goals were to (1) introduce the

barricade chambers to the miners, (2) inform the work force about procedures in place for its mine rescue team to support an evacuation, and (3) provide an opportunity to explore other escape strategies for super longwall panels.

We administered the exercise to 172 individuals at the mine. After each class, we asked the miners to complete a questionnaire. According to the results, 99% said that the situation described in the training exercise could happen in real life and 96% indicated that the exercise helped them remember something important regarding escape from a mine fire. Finally, although only 57% of the trainees had seen the barricade chambers, over 86% said that they would use one in an emergency. In summary, the exercise heightened awareness of the mine's barricade chambers and showed workers that there are situations where barricading should be considered as an option.

As more mines consider super longwall panels, escape will become an important concern. Operators will need to address whether it is feasible for their miners to traverse long distances in an evacuation. If not, other options may need to be considered.

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